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Bridging the Gap between Spreadsheet Use and Control: An Instructional Case

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ABSTRACT: End user applications (such as spreadsheets) have been cited as a previously ignored yet potentially significant risk to financial reporting in the wake of The Sarbanes-Oxley Act (PricewaterhouseCoopers [PwC] 2004; Ernst&Young [E&Y] 2004). We developed a realistic spreadsheet model in order to expose students to internal control issues inherent in a spreadsheet environment. By completing the case, students develop skills relating to auditing information systems and evaluating spreadsheet controls, functions, and formulas. Students also have an opportunity to improve written communication skills by conveying their findings to others in a memorandum.

I. INTRODUCTION

Spreadsheet control and accuracy are receiving more attention with the focus on financial reporting controls under The Sarbanes-Oxley Act (U.S. House of Representatives 2002). Client advisory documents concerning Section 404 compliance cite end user applications (such as spreadsheets) as a previously ignored yet significant threat to financial reporting (PwC 2004; E&Y 2004).¹ It appears that a gap exists between the degree of reliance on spreadsheets and the control over spreadsheets. This problem-based learning case requires students to test the effectiveness of a realistic, complex spreadsheet environment. Case learning objectives include increasing students' abilities to enumerate application and general controls in a spreadsheet environment, improving students' abilities to recognize spreadsheet errors, and allowing students an opportunity to recommend solutions to both control problems and errors detected through the course of their audit.

Spreadsheets are an integral part of many companies' financial management and reporting processes (Durfee 2004). Companies use spreadsheets to support financial reporting in a multitude of ways. A spreadsheet application may be calculating a dollar amount for a journal entry (such as the allowance for uncollectible accounts), or it may be holding the supporting records for a journal entry or ledger account balance (such as the aging of accounts receivable at a point in time). Spreadsheets also may help companies consolidate subsidiaries' financial data into the consolidated financial statements. These are only a few examples of how companies are using spreadsheets to support financial accounting and reporting.

¹ Following the first round of integrated audits, some companies asked the PCAOB for additional guidance on the evaluation of spreadsheets in the financial reporting process (see, for example, Smith 2005).

Surprisingly, many companies that use spreadsheets in financial reporting have primary accounting software, such as an enterprise resource planning (ERP) system. What may begin as a “temporary” solution—a spreadsheet for a quick calculation—evolves into a key part of the company’s financial reporting system, relied upon each time the calculation is needed (Baxter 2006). Furthermore, corporate accountants often are more familiar with using Excel® to perform a calculation than their ERP or other accounting package (which might require queries and a report-writer to achieve the same calculation). As an informal or *ad hoc* solution, spreadsheets are seldom subject to the same control rigor as formal software applications. Compounding this issue is the fact that spreadsheets are error-prone and spreadsheet “developers” are often overconfident in their spreadsheet-produced results (Panko 2005).

In the case of Vintage Wineries, students encounter a publicly traded client that uses spreadsheets to support its financial reporting process. Students must consider the company’s policies regarding the development and use of spreadsheets. Furthermore, they must “audit” one of the client’s financial reporting spreadsheet applications concerning fixed assets and depreciation.

II. THE CASE OF VINTAGE WINERIES

You work as an associate for a PCAOB-registered public accounting firm. You are assigned to the Vintage Wineries (VW) audit engagement for the year-ended December 31, 2007. As part of the firm’s integrated audit of VW, you have the task of evaluating the controls surrounding VW’s use of spreadsheet models in its financial reporting process. These spreadsheet models determine the dollar amounts of certain journal entries relating to VW’s fixed assets, accumulated depreciation, and depreciation expense. VW has multiple spreadsheet models outside of its core accounting software, which was implemented in late 2003. While the new software is capable of handling most of the calculations performed by VW’s custom spreadsheet models, the accounting personnel have yet to find the time to transfer the data over to the new software. Preparing documentation for Section 404 compliance during this same period has consumed a majority of their time.

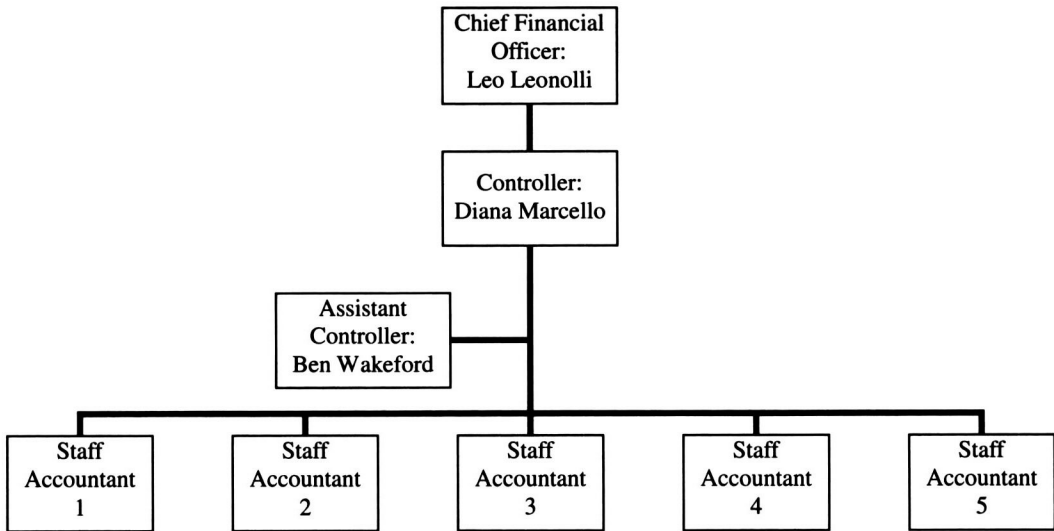
Company Background

The story of Vintage Wineries began in late 1999 as a vision of the Leonolli family. The first winery opened in January 2000 in Napa and proved to be successful. In 2002, the Leonolli family seized a window of opportunity to take the company public. Using the proceeds from the public offering, VW opened two more wineries in the nearby towns of Yountville and Calistoga. Today, Vintage Wineries is recognized for outstanding quality and has earned an impressive number of awards.

Diana Marcello, the company’s controller, heads the accounting department. Ben Wakeford, the assistant controller, and five staff accountants report to her. Diana is the first and only controller of VW. She personally hired each of her staff members, including Ben, who has been with VW since 2002. Diana reports to the company’s Chief Financial Officer, Leo Leonolli. Over seven years of auditing VW, your firm has developed an excellent relationship with VW’s accounting staff.

Working through the initial public offering with VW provided your firm with a deep understanding of VW’s financial reporting process. Management has generally implemented improvements suggested by your firm at the close of each audit. One exception is the continued use of custom-developed spreadsheet models for the preparation of certain significant journal entries. The *ad hoc* spreadsheet models were developed prior to 2003, when the company was using a very simplistic accounting software package. Diana, a proficient

FIGURE 1
Vintage Wineries
Organizational Chart of Accounting and Financial Reporting Functions



spreadsheet user, felt more confident in results provided by her spreadsheets than those provided by the accounting software. She felt she did not know “how the software was working.” Though Diana has agreed that the new accounting software could reliably produce the journal entry amounts, she and her staff have not had the time to transfer years’ worth of data into the new software and implement those software modules, and do not foresee having the time to do so in the near future. In her words, “It’s just easier and quicker to pull the amounts from the spreadsheets that we’ve always used ... and I know they’re right!”

Depreciation Model

One spreadsheet model in particular, used to calculate depreciation, has kept your attention. It is more complex than others you have evaluated during the VW audit. The model consists of a group of linked Excel files. The base file provides a reference for the depreciation method and useful life for all depreciable assets (see VW Dep Methods.xls). Five additional Excel files, one for each asset class, contain depreciation records for the individual assets and reference the base file to determine the appropriate method and useful life for each asset (see VW Dep Sch [Admin].xls, VW Dep Sch [Bottling].xls, VW Dep Sch [Buildings].xls, VW Dep Sch [Cellar].xls, and VW Dep Sch [Crush].xls). Each of these depreciation workbooks contains multiple worksheets, as there are many individual assets in each asset class. A final workbook computes a period depreciation total by referencing the five depreciation record workbooks (see VW Dep Totals.xls).

In preparation for this engagement, the engagement senior asked Vintage Wineries for documentation regarding the depreciation spreadsheets. Diana Marcello provided several items regarding the structure of the model. Table 1 is a complete inventory of the workbooks and worksheets within the workbooks. Figure 2 illustrates the structure of the complete



TABLE 1
Spreadsheet Inventory
(Prepared by Client)

Workbook	Brief Description	Worksheets
VW Dep Methods.xls	Contains information regarding depreciation method and asset life (referred to as the "base file").	Winery Dep Methods
VW Dep Sch (Admin).xls	Contains worksheets for all administrative assets such as vehicles and office equipment.	Workbook Contents, Truck 1 (Napa), Truck 2 (Napa), Truck 3 (Calistoga), Truck 4 (Yountville), Car 1 (Napa), Car 2 (Napa), Car 3 (Calistoga), Car 4 (Yountville), Car 5 (Yountville), Car 6 (Napa), Car 7 (Calistoga), Car 8 (Napa), Copier (Napa), Copier (Calistoga), Copier (Yountville), IBM Server (Napa), POS 1 (Napa), POS 2 (Napa), POS 3 (Napa), POS (Calistoga), POS (Yountville), Desks (Napa), Conf Table (Napa), Desks (Calistoga), Office Seating (Calistoga), Desks (Yountville), Office Seating (Yountville)
VW Dep Sch (Bottling).xls	Contains worksheets for all assets used in the bottling process.	Workbook Contents, Bottle Washer (Napa), Bottling Tanks (Napa), Bottling Corker (Napa), Bottling Foiler (Napa), Bottling Labeler (Napa), Bottling Spinner (Napa), Bottle Washer (Calistoga), Bottling Tanks (Calistoga), Bottling Corker (Calistoga), Bottling Foiler (Calistoga), Bottling Labeler (Calistoga), Bottling Spinner (Calistoga), Bottle Washer (Yountville), Bottling Tanks (Yountville), Bottling Corker (Yountville), Bottling Foiler (Yountville), Bottling Labeler (Yountville)
VW Dep Sch (Buildings).xls	Contains worksheets for all buildings.	Workbook Contents, Arpel (Napa), Avignon (Napa), Bordeaux (Napa), Chavenay (Napa), Lille (Yountville), Marseilles (Calistoga), Metz (Napa), Nior (Napa) Lille (Yountville), Marseilles (Calistoga), Voiron (Napa)

(continued on next page)

TABLE 1 (continued)

VW Dep Sch (Cellar).xls	Contains worksheets for all assets used in the aging process.	Workbook Contents, Aging Bins (Napa), pH Meter 1 (Napa), pH Meter 2 (Napa), pH Meter 3 (Napa), Pump 1 (Napa), Pump 2 (Napa), Pump 3 (Napa), Refrigeration Sys (Napa), Aging Bins (Calistoga), pH Meter 1 (Calistoga), pH Meter 2 (Calistoga), Pump 1 (Calistoga), Pump 2 (Calistoga), Refrigeration Sys (Calistoga), Aging Bins (Yountville), pH Meter (Yountville), Pump (Yountville), Refrigeration Sys (Yountville)
VW Dep Sch (Crush).xls	Contains worksheets for all assets used in the extraction process.	Workbook Contents, Centrifuge 1 (Napa), Centrifuge 2 (Napa), Fermentation Tank 1 (Napa), Fermentation Tank 2 (Napa), Fermentation Tank 3 (Napa), Hopper (Napa), Must Chiller (Napa), Press 1 (Napa), Press 2 (Napa), Scale 1 (Napa), Scale 2 (Napa), Scale 3 (Napa), Centrifuge (Calistoga), Fermentation Tank (Calistoga), Hopper (Calistoga), Must Chiller (Calistoga), Press (Calistoga), Scale (Calistoga), Centrifuge (Yountville), Fermentation Tank (Yountville), Hopper (Yountville), Must Chiller (Yountville), Press (Yountville), Scale (Yountville)
VW Dep Totals.xls	Contains summary worksheets and calculates total depreciation expense by month.	Calculate Deprec for Month, Administrative Assets Breakdown, Bottling Assets Breakdown, Building Assets Breakdown, Cellar Assets Breakdown, Crush Assets Breakdown



FIGURE 2
Workbooks in the Spreadsheet Application
(Prepared by Client)

Vintage Winery			
Depreciation Method by Asset Type			
ASSET TYPE	METHOD	LIFE	
Admin - Automobiles	SL	5	
Admin - Computer Hardware	SL	5	
Admin - Light Trucks & Vans	SL	5	
Admin - Office Equipment	SL	5	
Admin - Office Furniture	SL	10	

VW Dep Sch (Admin).xls^a

Vintage Winery - Depreciation Schedule			
Asset	Asset Class	Asset Location	Asset Original Cost
Truck 1			
Admin - Light Trucks & Vans	Admin	Napa	\$35,000
Asset Acquisition Date	1/1/2000		
Depreciation Info:			
Method	SL		
Depreciation Schedule	Monthly		
Estimated Useful Life	5		
Estimated Salvage Value	\$1,500		
SL Depreciation Amount (Monthly)	\$558		
SL Rate	20.0%		
EDB Rate of Depreciation			
40.0%			
Date	Depreciation Period	Current Depreciation	Accumulated Depreciation
1/1/2000	0	0	0
1/31/2000	1	558	558
2/29/2000	2	558	1,117

VW Dep Totals.xls

Asset Type	Napa	Cellar	Yearville	Totals
Admin	4,368.73	1,899.92	1,676.51	7,955.16
Boatling	249.92	1,155.68	1,073.67	2,479.27
Buildings	1,851,238.92	1,530,175.75	1,454,992.28	4,836,406.95
Cellar	668.21	533.19	389.35	1,590.75
Crush	10,486.21	3,069.28	3,311.33	16,867.13
Totals	1,867,011.99	1,516,824.13	1,461,443.14	4,865,279.25

^a Other workbooks organized like this one: VW Dep Sch (Boatling).xls, VW Dep Sch (Buildings).xls, VW Dep Sch (Cellar).xls, and VW Dep Sch (Crush).xls.

Each subtotal above is computed in a corresponding worksheet by Asset Type. See other worksheets in this workbook.

Annual Depreciation for Current Year: **38,383,351.04**

The VW Dep Sch worksheets reference the VW Dep Methods worksheet for "method" and "estimated useful life." See Figure 3 for additional details on the VW Dep Sch workbook.

The VW Dep Totals workbook references the VW Dep Sch workbooks for depreciation on each asset. For example, the worksheet "Administrative Assets Breakdown" (in VW Dep Totals) sums depreciation from all worksheets in VW Dep Sch (Admin). The "Calculate Deprec for Month" worksheet in VW Dep Totals then sums the depreciation totals from its worksheets. See Figure 4 for additional details on the VW Dep Totals workbook.

Refers to

Refers to

spreadsheet application, particularly how the workbooks are linked. Figure 3 provides the structure of the asset depreciation schedule template (which is the worksheet used to calculate depreciation for each individual asset) and identifies which data are manually entered

FIGURE 3
Design of the Depreciation Schedule (VW Dep Sch) Worksheets
 (Prepared by Client)

	A	B	C	D	E
1	Vintage Winery - Depreciation Schedule				
2	Asset	Truck 1			
3	Asset Class	Admin - Light Trucks & Vans			
4	Asset Location	Napa			
5	Asset Original Cost	\$35,000			
6	Asset Acquisition Date	1/1/2000			
7	Depreciation Info:				
8	Method	SL			
9	Depreciation Schedule	Monthly			
10	Estimated Useful Life	5			
11	Estimated Salvage Value	\$1,500			
12	SL Depreciation Amount (Monthly)	\$558			
13	SL Rate	20.0%			
14	DDB Rate of Depreciation	40.0%			
15					
16		Depreciation	Current	Accumulated	Net BV of
17	Date	Period	Depreciation	Depreciation	Asset
18	1/1/2000	0	0	0	35,000
19	1/31/2000	1	558	558	34,442
20	2/29/2000	2	558	1,117	33,883
21	3/31/2000	3	558	1,675	33,325
22	4/30/2000	4	558	2,233	32,767
23	5/31/2000	5	558	2,792	32,208
24	6/30/2000	6	558	3,350	31,650
25	7/31/2000	7	558	3,908	31,092
26	8/31/2000	8	558	4,467	30,533
27	9/30/2000	9	558	5,025	29,975
28	10/31/2000	10	558	5,583	29,417
29	11/30/2000	11	558	6,142	28,858

Data manually entered for each asset.

Lookup functions find the asset class in the VW Dep Method workbook and retrieve method and estimated useful life.

Amounts are automatically calculated using data in C2:C11.

Current Depreciation, Accumulated Depreciation, and Net BV of Asset are automatically calculated using formulas and functions.

The initial date (A17) references the acquisition date (C6); remaining dates are filled down the column.

When a new asset is acquired, a new worksheet is added to the appropriate workbook (asset class). A link to the new worksheet is placed on the *Workbook Contents* worksheet.



and which are automatically calculated. Finally, Figure 4 provides an overview of the depreciation totals workbook.

Diana developed the spreadsheet model shortly after the company's inception. Since the company closes the books each month, and thus records depreciation each month, she determined that developing a spreadsheet to compute the recurring monthly amount would be a good use of her time. Diana developed the spreadsheet with the idea that it could be easily appended with new worksheets for additional assets that VW would acquire.

The spreadsheets are stored on a server within the accounting department, along with other financial accounting spreadsheets and data stores. Everyone on the accounting staff has access to the spreadsheets; however, only Ben and Diana access them regularly. Staff accountants have no reason to use the spreadsheets unless specifically instructed to do so by Diana. Ben typically accesses the spreadsheets to update worksheets with current data. However, Diana insists that she make any necessary changes to the structure of the model or add new worksheets (such as for new assets) when necessary.

III. REQUIREMENTS

Recall that your assigned task is to evaluate the controls surrounding VW's use of spreadsheet models in its financial reporting process. Based upon the information provided in the case and reasonable inferences, prepare a memorandum to your project senior addressing the following concerns:

- General controls over the company's use of spreadsheets in its financial reporting process, including the risk(s) mitigated by the controls. Be sure to consider controls that are currently present (strengths) as well as those that should be present but are not (weaknesses). (You may assume that other spreadsheets used in VW's financial reporting process are used in a manner similar to the depreciation spreadsheet model.)
- Application controls within the company's depreciation spreadsheet model, including the risk(s) mitigated by the controls. Be sure to consider controls that are currently present (strengths) as well as those that should be present but are not (weaknesses).
- Errors (or the potential for future errors) that you discovered in the depreciation model. For each error, identify the ramifications of the error remaining unresolved and propose a correction/solution, if possible. It may be helpful to organize the errors identified in a table, such as:

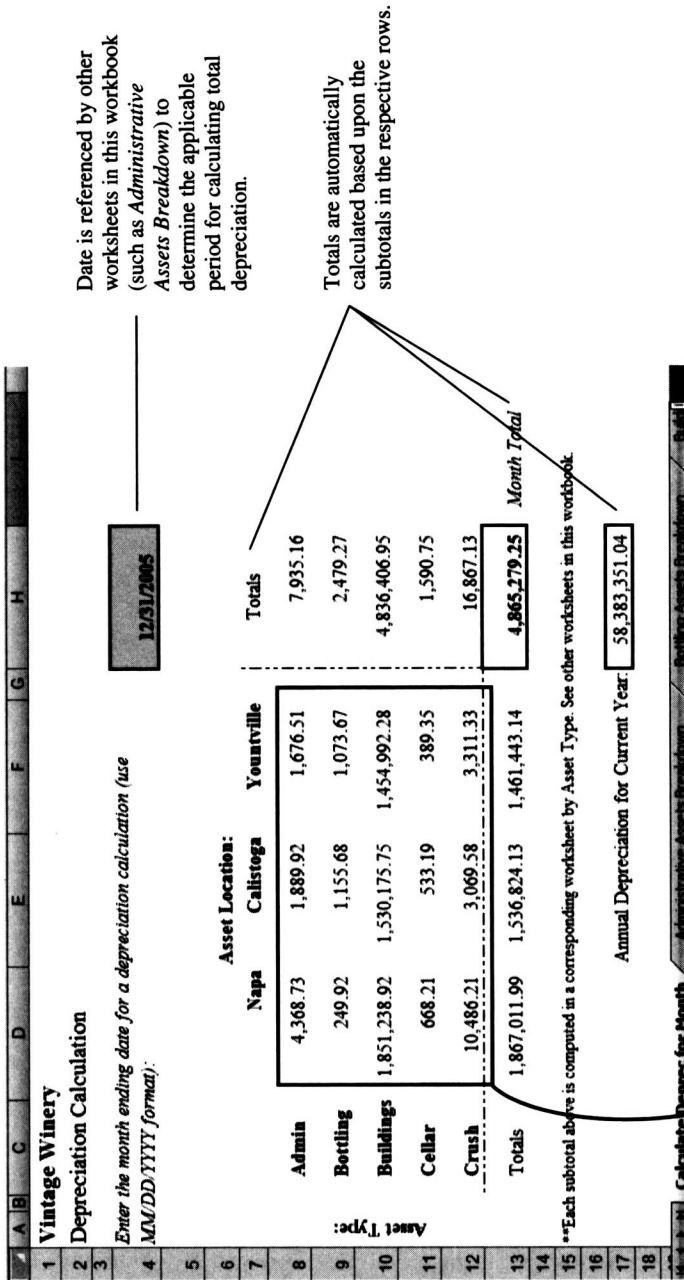
Error Cell Ref. ²	Error	Ramification if Unresolved	Potential Correction/Fix
------------------------------	-------	----------------------------	--------------------------

- Recommendations regarding improvements (both from a control perspective and regarding errors in this specific spreadsheet model). Keep in mind the cost-versus-benefit tradeoff and feasibility.

Your instructor will provide you with the spreadsheet files as well as more specific guidance on the format of the memo. For example, your instructor may direct you to use bulleted lists or a tabular format for certain requirements.

² For ease of reference to an error, use the notation Workbook: Worksheet: Cell(s) (for example, "VW Dep Sch [Buildings]: Arpel Wine Storage Cave: A1").

FIGURE 4
Design of the Depreciation Total (VW Dep Totals) Workbook
 (Prepared by Client)



Cells reference other worksheets in this workbook (such as *Administrative Assets Breakdown* and *Bottling Assets Breakdown* seen above), used to calculate these totals.

IV. SUGGESTED READINGS FOR STUDENTS

The following suggested readings may improve your understanding of spreadsheet use in the financial reporting process and assist you in completing the requirements of the case:

- The use of spreadsheets: Considerations for Section 404 of the Sarbanes-Oxley Act (PwC 2004).
- The role of spreadsheets in today's corporate climate (Baxter 2006).
- Living with = SUM (Alexander 2006).
- Spreadsheet Research Website (Panko 2005).

V. CASE PURPOSE AND LEARNING OBJECTIVES

Case Purpose

The Sarbanes-Oxley (SOX) Act of 2002 has heightened the focus on internal controls within both public and private entities. Due to automated business and financial processes, the internal control system plays a vital role in ensuring that the financial information generated by accounting and enterprise resource planning (ERP) systems is reliable. The presence of general and application controls is a key component of an effective control environment that management and auditors are required to assess on an annual basis under Section 404 of SOX. This case challenges students to apply their knowledge of general and application controls in a realistic setting. It also tests their ability to identify errors and weaknesses and develop practical control recommendations/solutions.

The spreadsheet application encountered by students is complex due to the large quantity of data, large number of formulas, complexity of formulas, and linkage of multiple spreadsheets. The spreadsheet series contains seeded errors, control weaknesses, and poor design elements, with varied effects on the depreciation calculation. Combining contextual information about the company's process for developing and using the spreadsheets with the actual spreadsheet application provides a rich case study, particularly for studying effective controls (and witnessing the outcome of client failure to exercise good control). Secondly, working within a spreadsheet environment will increase students' spreadsheet competence, perhaps helping to lessen the expectations gap between academics and professionals on the development of spreadsheet skills in the classroom (Bain et al. 2002; Fordham 2005).

Learning Objectives

The learning objectives vary based upon the case requirements assigned. If an instructor assigns all requirements, students should use their knowledge to:

- Enumerate the IT general control weaknesses over a company's development and use of spreadsheet applications.
- Enumerate the IT application control weaknesses in a complex spreadsheet application.
- Describe the risks associated with weaknesses previously enumerated.
- Detect and correct existing errors in a complex spreadsheet application.
- Propose improvements (or remediation steps) for a company's development and use of spreadsheet applications.

These learning objectives serve to develop students' spreadsheet skills, internal control knowledge, and information systems auditing skills.

VI. SUGGESTED AUDIENCE AND USE

We chose depreciation as the central accounting issue because it is a fundamental (or principles-level) accounting topic, understood by both graduate and undergraduate students. We designed the case for use in an accounting information systems course; however, the case could also be effective in an auditing or IT auditing course. If used in an auditing or graduate-level accounting information systems course, the instructor may wish to amend the requirements to include referencing the controls and errors to management's financial statement assertions and/or audit objectives.

We suggest that the instructor introduce students to internal control concepts, particularly within the IT environment, prior to assigning the case. We recognize that some instructors may cover the Control Objectives for Information and Related Technology (CobiT) model of IT governance and others may use the Committee of Sponsoring Organizations of the Treadway Commission (COSO) model of internal control. We believe that either approach provides an appropriate foundation for the students, particularly with an emphasis on understanding general and application controls. The teaching notes provide instructors with the authors' presentation (including PowerPoint® slides), as well as a potential methodology for completing the assignment (which can be provided to students in addition to the case materials). On the day the project is assigned, we recommend providing students with a short in-class "practice" exercise concerning a spreadsheet with several seeded errors. This exercise will familiarize the students with the specific task of testing the spreadsheet.

The case may be assigned effectively to individuals or teams, though the latter may be more efficient. The spreadsheet model is large and may seem overwhelming as an individual project (particularly for undergraduate students). However, assigning the case to individuals ensures that each student must then work with the spreadsheet application. The case has been used in five sections of an undergraduate accounting information systems course, in both semester and condensed summer terms, at a large university in the southeastern United States. After completing units on internal control and Excel, students received an overview of auditing spreadsheets in lecture format that included a suggested "how-to" methodology. The students completed the case over a period of four weeks near the end of the semester. Students self-reported an average of eight hours spent looking for errors and approximately one and one-half hours spent developing the memo. After students submitted the project, a portion of one class session covered the case control issues and errors to provide feedback on the project.

In order to assess whether the learning objectives of the case were met, two sections of students (61 students) who completed the case were asked about their learning experiences with the case. Eighty-two percent of students indicated that completing the case improved their ability to recognize control weaknesses in a spreadsheet model; seventy percent indicated that completing the case improved their ability to recognize financial reporting errors in a spreadsheet model.

In addition to the previously mentioned materials, the teaching notes of the case provide the recommended solutions to requirements, including a sample memo and a grading guide.

TEACHING NOTES

Teaching Notes are available only to full-member subscribers to the Journal of Information Systems through the American Accounting Association's electronic publications system at <http://www.atypon-link.com/action/showPublisherJournals?code=AAA>. Full member subscribers should use their personalized usernames and passwords for entry into the system where the Teaching Notes can be reviewed and printed.

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